Bulletin No. 298 - The Wyoming Sheep Coat

University of Wyoming Agricultural Experiment Station

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Publication Information
THE WYOMING SHEEP COAT

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June 1950
The Third Sheep-coat Test—January 1941. In this band of 1,000 sheep, 500 wear coats.
The Wyoming Sheep Coat

By Robert H. Burns and Alexander Johnston*
Wool Specialists

The use of some type of covering on sheep to protect the fleece from damage by environmental influences is not a modern idea. Hart (1917) relates that in ancient times fine-wooled sheep of the Tarentine breed in Italy were covered with cloths or skins in order to protect the wool from the effects of weathering by sun and wind and dirt penetration. These Romans went to even greater lengths to insure good wool quality, for they frequently removed the covering and combed the fleeces to prevent matting. Often the fleeces were moistened with oil and even with pure wine and washed in water three or four times a year.

For many years it has been a universal custom to cover exhibition animals in stud flocks with some light fabric so that dust and vegetable particles from feed racks will not lodge in the wool. The practice, however, was not applied until recently to commercial range-sheep management.

During the past 15 years a considerable number of sheep-rugging tests have been carried out in Australia and New Zealand; the results have been rather contradictory. The Australians call a sheep coat a rug and hence the term rugging. Austin (1936), Duncan (1938) and (1939), Scott (1935), and Williams (1935) report both more clean wool per head and a higher price per pound in favor of rugged sheep. On the other hand, Blumer and Cotsell (1938), Montgomery (1938), Pike (1939), Shone (1939), and Thomas and Throssel (1939) found no appreciable difference in clean fleece weights or in value per fleece. All of these tests were in Australia except the one by Shone, which was carried out in South Africa. These results, unfavorable to rugging, were more prevalent in low-burr and dust areas.

As far as body weights are concerned, only Austin reports in favor of rugged sheep, while Montgomery, Blumer and Cotsell, Pike, and Levy found no appreciable difference; in some instances the unrugged sheep showed heavier body weights than the rugged ones. Pierce reported that there was no advantage in rugging insofar as the growth of lambs and the

* The writers wish to acknowledge the close cooperation of the Cotton Processing Division of the Southern Regional Research Laboratory, New Orleans, Louisiana, who furnished the coats and ropes. The cooperating sheepmen were Keith Morrison and Flag Ranch of Laramie and Seaverson Livestock Company and Hadsell Sheep Company of Rawlins. Mr. J. K. le Roux, graduate assistant, helped with preparation of the bulletin.
milk yield of the mothers were concerned. Williams and Duncan found that rugging had some advantages in fat-lamb production.

The reports of these investigators show that under very dusty and dry conditions, the rugged sheep produced wool with a higher yield and a more attractive appearance calling for a higher value per fleece than the wool from unrugged sheep. In ranges where there was little dust or burr, there was no substantial advantage in using rugs. The rugging showed no conclusive advantages insofar as body weights were concerned, and the lambing percentages were inconclusive.

Range sheepmen have shown considerable interest in testing out sheep coats under western range conditions to find out what advantages and disadvantages they have.

Accordingly, the Wool Department of the Wyoming Agricultural Experiment Station in cooperation with the Cotton Processing Division of the Southern Regional Research Laboratory of the U. S. Department of Agriculture at New Orleans, Louisiana, has been testing out various phases of the sheep-coat problem in the past few years. This bulletin covers the work which has been completed up to 1944, when the experiment was closed.

OBJECTS OF EXPERIMENTS

1. To discover whether the use of sheep coats for range sheep is practical.
2. Will the use of sheep coats show beneficial results in wool, mutton, and lamb production?
3. Is the use of sheep coats economically sound?
4. To design a sheep coat which will be adjustable, durable, and economical.

METHODS OF EXPERIMENTATION

Six different tests were made with sheep under range conditions at four different ranches.

Experiment No. 1 ran for a 5-month period from November 1938 to April 1939. Fourteen Fine-wool lambs, 7 months of age, belonging to Mr. Keith Morrison, which were running on the Laramie Plains north of Laramie, were used. Seven of these lambs were rugged and the other seven were used as controls. The range was a well-sodded type. From mid-January they were penned for six weeks and fed a ration of corn and native hay. During the month of March, when they were again on the range, they received 2 ounces of corn in addition to native hay during a storm period of 3 to 4 days. When the coats were fitted on November 12, 1938, staple lengths were measured on the shoulder, side, and back of each animal, and samples were taken from each sheep for fiber-density and fineness determinations. Body weights were also taken. On April 25, 1939, after a period of approximately 5 months, the coats were removed, and measurements and samples duplicate to those taken at the beginning of the test were obtained.

Experiment No. 2 ran from November 1939 to June 1940. The object of this test was to find out the effect of cotton coats on the fleeces and body weights of old ewes when these coats were put on for the winter months. This test was conducted in cooperation with the Flag Ranch (Albany County), which has a sandy, dry range with less grass than the range used in Experiment No. 1. Eighteen ewes were selected, six bearing Fine wool, six ½-blood wool, and six ¾-blood wool. A few extra ewes were added in the ½-blood and ¾-blood grades. Each ewe was sampled, taking a strip of wool about 2 inches wide and 4 inches long from the backbone down to the middle of the side. Staple length was taken at three places along the back, top of the shoulder over the junction of the last rib and backbone, and at a point midway between the first two points. Each ewe was ear-tagged and the body weight was taken. They were then fitted with a coat. After each ewe was sampled, weighed, and coated, a companion ewe of the same visual type was selected as a check. These ewes were ear-
FIG. 2—Fitting a Sheep Coat in the 1941 Experiment. Modified type with open front. The rope ties make the coat adjustable in front and at the rear legs. Photo taken in January, when sheep had six months of wool; hence the coat is a little small for this ewe.

L-R: Dettling the herder, Klink the owner, and Burns, in charge of the test tagged and weighed in a manner similar to the others but did not receive a coat.

Experiment No. 3, also carried on at the Flag Ranch south of Laramie, ran from October 1940 to June 1941. This, the largest of the coat tests, was divided into two groups of sheep. There were 35 old ewes in the first group, which were on test from October 1940 to June 1941. From the same band of sheep there were 1002 old ewes in the second group, which were on experiment from January to June 1941. In October, 35 old ewes were selected; 18 were fitted with coats, and 17 were left coatless. The coats used were the smallest size supplied by the Cotton Division of the Southern Regional Laboratory and had the following measurements:

Neck to tailhead 25 inches
Midback to lowside 19 inches
Back of neck to throat 16 inches

These measurements indicated that the coats should have been a little longer and deeper, but the adjustment at the neck and leg ropes, as shown in Figure 2, would take care of different body sizes of ewes. The back adjustments by rope were discarded, for the ropes puckered the coat and made it catch on fences and snags. Arrangements had been made with the Cotton Division of the Southern Regional Laboratory for them to furnish a large number of coats for an extensive test. These coats were not available in October 1940, but in January 1941 the coats came and at this time, by dodge-gate selection, alternate old ewes of the same band were fitted with coats and the others left as controls. At this time 503 aged sheep were fitted with coats after body weights and staple lengths were determined. The control group consisted of 499 aged ewes which were treated similarly. At shearing time in June 1941, the ewes were weighed, staple lengths taken, and the fleeces sampled. In addition three bags of coated wool and three bags of coatless wool were selected at spaced intervals from the 13 bags of coated fleeces and the 14 bags of coatless fleeces obtained from the experimental groups. These six bags of wool were scoured at the Wyoming State Penitentiary woolen mill.

Experiment No. 4 was carried out at the Flag Ranch southwest of Laramie from July 1941 to June 1942. A total of 341 ewes from a “dry band” were fitted with coats, and a control group of 343 ewes from this same band had no coats. The object was to see how the coats would stay on over a 12-month period, and the condition of those which stayed on. Studies were made on staple length, body weight, shrinkage, dirt content, and greasy and clean fleece weights of these sheep. In this test a study was made of the economy of coats for wool production including their durability.

Experiment No. 5 was carried out in cooperation with the Seaverson Livestock Company of Rawlins, Wyoming.

This test consisted of two different-age groups of sheep. The first group consisted of 40 mature ewes and the second group of 40 yearling ewes. These sheep were grazed in summer on high mountain ranges and in winter on the Red Desert. At shearing time in May 1942, 40 mature ewes were selected in pairs according to grade of their wool as well as body size and robustness of appearance. These ewes were marked with a numbered ear tag; their fleeces were graded, weighed, and sampled for shrinkage determination. In this way a record was obtained on the fleece each
ewes produced during the year before the sheep-coat test. In October 1942, at shipping time, the sheep were inspected. Fourteen of the ear-tagged ewes could not be found, and a like number of replacements were ear-tagged and placed in the test. All of the ewes were weighed in the fleece and the staple length was measured at three places on the side of the sheep. One of each pair of ewes as selected at shearing time or any replacements were fitted with a coat for the winter. At shearing time in April 1943, 17 rugged ewes and 19 unrugged ewes were located, weighed in the fleece, the staple length measured, and the fleeces graded, weighed, and sampled. In October 1942, 40 ewe lambs born in spring of 1942 were selected and ear-tagged. Odd-numbered ewes were fitted with a coat, and even-numbered ones were left coatless. Unshorn body weights were taken, along with the staple length measured at three places along the side. At shearing time in April 1943, 39 of these ewes, now yearlings, were located. Of these, 20 had coats and 19 were coatless. Body weights in fleece as well as the staple length at three places on the side were taken. When the sheep were sheared the fleece weight was taken and the fleece graded and sampled.

Experiment No. 6 was carried on in cooperation with the Seaverson Livestock Company. This test was a continuation of Test No. 5, dealing with the yearling ewes only, to see the effect of coats on the same ewes over a period of years. The cooperating sheep outfit found it difficult, if not impossible, to obtain labor for the ranch and wished to discontinue all tests except the one with the ewe lambs carried to yearlings which are now 2-year-olds. In November 1943 the sheep were examined. Two unrugged or coatless ewes, Nos. 34 and 48, could not be found in the group and with No. 40, which was missing at shearing time in April 1943, made a total of three unrugged or coatless sheep which were missing. In a study of the cumulative effect of coats on the fleece, it was not possible to use replacements, and consequently the test consisted of 20 ewes with coats and 17 ewes without coats. Coats were put on the 20 ewes in the rugged or coated group which had worn coats the previous year. All of the ewes were weighed in the fleece, and the staple length was measured at three places on the side of the sheep. At shearing time in May 1944, 18 of the coated ewes and 16 of the coatless ewes were located. They were weighed in the fleece, the staple length measured, and the fleeces then graded, weighed, and sampled.

RESULTS OF SHEEP-COAT EXPERIMENTS

In Experiment No. 1 (1938-39), no significant differences were found
to exist between coated and coatless sheep in respect to staple length, density, and fineness of fleece or in body weights of the coated and coatless sheep. The conclusion in this test was that putting coats on yearling Fine-wool sheep on a well-sodded range did not prove advantageous in respect to either fleece or body.

**Experiment No. 2 (1939-40),** which had a small number of sheep in each grade of wool, gave the following results:

<table>
<thead>
<tr>
<th>Fleece weight in</th>
<th>Staple length in mm.</th>
</tr>
</thead>
<tbody>
<tr>
<td>pounds Greasy</td>
<td>Clean Nov. 1939 June 1940 Percent increase</td>
</tr>
<tr>
<td>Fine fleeces</td>
<td></td>
</tr>
<tr>
<td>3 coated sheep</td>
<td>10.33 3.26 39 65 67</td>
</tr>
<tr>
<td>3 coatless sheep</td>
<td>10.5 2.32 33 51 55</td>
</tr>
<tr>
<td>½-blood fleeces</td>
<td></td>
</tr>
<tr>
<td>5 coated sheep</td>
<td>11.5 3.52 44 71 61</td>
</tr>
<tr>
<td>4 coatless sheep</td>
<td>8.8 3.00 55 74 35</td>
</tr>
<tr>
<td>⅞-blood fleeces</td>
<td></td>
</tr>
<tr>
<td>5 coated sheep</td>
<td>10.8 3.82 56 89 59</td>
</tr>
<tr>
<td>4 coatless sheep</td>
<td>8.38 2.85 59 82 39</td>
</tr>
<tr>
<td>All grades of fleeces</td>
<td></td>
</tr>
<tr>
<td>13 coated sheep</td>
<td>10.9 3.54 46 75 63</td>
</tr>
<tr>
<td>11 coatless sheep</td>
<td>9.2 2.77 49 69 41</td>
</tr>
</tbody>
</table>

In all grades of fleeces the sheep wearing coats produced more clean wool per fleece, the difference amounting to around \( \frac{3}{4} \) of a pound. The coated sheep grew fleeces which showed greater growth of wool from November to June and similarly gave lower shrinkages, because less dirt penetrated into the fleece.

In **Experiment No. 3 (1940-41),** there were two separate groups of sheep, one of which wore coats for a 7-month period; the other, a much larger group, had coats for only 4 1-3 months. These two groups of sheep gave the following results:

**Greasy-fleece weights:**

<table>
<thead>
<tr>
<th>Test 1</th>
<th>Coats on for 7 months</th>
<th>11 coated ewe fleeces averaged</th>
<th>2 coatless ewe fleeces averaged</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>12.54 lbs.</td>
<td>12.35 lbs.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Test 2</th>
<th>Coats on for 4 1-3 months</th>
<th>476 coated ewe fleeces averaged</th>
<th>329 coatless ewe fleeces averaged</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>11.62 lbs.</td>
<td>12.51 lbs.</td>
</tr>
</tbody>
</table>

**Shrinkages from hand samples:**

<table>
<thead>
<tr>
<th>Test 2</th>
<th>Coats on for 4 1-3 months</th>
<th>345 coated ewe fleeces averaged</th>
<th>222 coatless ewe fleeces averaged</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>68.2 percent</td>
<td>69.8 percent</td>
</tr>
</tbody>
</table>
Clean-fleece weights:

Test 2  Coats on for 4 1-3 months
345 coated fleeces which were sampled averaged 3.70 lbs.
222 coatless fleeces which were sampled averaged 3.78 lbs.

Monthly staple growth during the test:

Test 1  Coats on for 7 months
17 coated fleeces averaged (on side)  6.79 mm.
7 coatless fleeces averaged (on side)  4.74 mm.

Test 2  Coats on for 4 1-3 months
484 coated fleeces averaged (on side)  5.05 mm.
440 coatless fleeces averaged (on side)  4.76 mm.

Monthly change in body weight during test
(corrected body weights)

Test 1  Coats on for 7 months. October—June
17 sheep wearing coats  gain of  0.49 lbs.
7 sheep without coats  gain of  0.30 lbs.

Test 2  Coats on for 4 1-3 months. January—June
484 sheep wearing coats  loss of  0.41 lbs.
440 sheep without coats  loss of  0.09 lbs.

The increase in greasy fleece weight of 0.19 pound for the coatless sheep in Group 1 was not conclusive because of the small number of fleeces and the rather small difference. In Group 2 the advantage for the coatless fleeces amounted to 0.89 pounds, which is a good difference. When this difference is translated to clean fleece weight, the coatless fleeces showed only slightly more clean wool with a difference of only 0.05 pounds. Thus there would seem to be little advantage in sheep wearing coats in this test.
as there is no appreciable difference in clean fleece weight. In all groups the coated fleeces gave more staple length. This, coupled with the fact that there was less clean wool, indicated that some of the follicles might be inactive when the sheep wore a coat. Body weights were corrected by deducting the fleece weight, inasmuch as it was necessary to weigh the sheep before shearing. In Test 1 both the coated and coatless sheep gained weight during the test. The sheep with coats gained 0.10 pound a month more than those without such protection. In Test 2 the reverse condition existed: sheep without coats lost less weight per month (0.32 pound) than those with coats.

In Experiment No. 3 a number of bags of wool were scoured at the State Penitentiary wool mill for Group 2, which included a large number of sheep. The weighted average shrinkage for the three bags of wool from coatless sheep amounted to 68.20 percent. These large bags showed around 2 percent less shrinkage than the small hand samples because, no doubt, of the more thorough dusting and scouring of the small hand samples. In both the entire bags and in the small hand samples, the wool from coated sheep showed around 2 percent less shrinkage than the wool from coatless sheep. The wools from coated sheep were much brighter in appearance.

The differences in shrinkage and staple lengths in favor of the coated fleeces confirmed the results of Experiment No. 2, run in 1939-40. Because of the fact that large numbers of coats were not available to fit on the sheep
in Group 2 until January and that the four winter months, during which the coats were on the sheep, were much milder than in the previous year, this test was too short to give satisfactory information on the value of the coats in effecting fleece and body factors.

Consequently *Experiment No. 4* was outlined in 1941-42 using a large number of coats in which an attempt was made to keep the coats on the sheep for a full 12 months. Information was obtained not only on the condition of the fleece and body weight, but also on the condition of the coats after use and on the number of coats lost and replaced.

At the conclusion of the test the following information came to light:

<table>
<thead>
<tr>
<th>July, 1941</th>
<th>June, 1942</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total number of sheep fitted with coats</td>
<td>341</td>
</tr>
<tr>
<td>Number of coats replaced to January 1942</td>
<td>100</td>
</tr>
<tr>
<td>Total number of coats put on</td>
<td>441</td>
</tr>
<tr>
<td>Total number of coats removed</td>
<td>240</td>
</tr>
<tr>
<td>Loss of coats due to snagging on buck brush and barbed wire</td>
<td>201 or 46%</td>
</tr>
</tbody>
</table>
Condition of coats taken off in June 1942:

<table>
<thead>
<tr>
<th>Condition</th>
<th>No.</th>
<th>pct.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Good</td>
<td>125</td>
<td>52</td>
</tr>
<tr>
<td>Poor</td>
<td>115</td>
<td>48</td>
</tr>
</tbody>
</table>

Average monthly growth of fleece during 11 months

- 234 out of 341 fleeces from coated sheep: 4.60 mm.
- 232 out of 343 fleeces from coatless sheep: 3.61 mm.

Monthly change in body weight of unshorn sheep during 11-month test

- 234 out of 341 coated sheep: 110.37—109.07 or 0.12 lb.
- 232 out of 343 coatless sheep: 113.00—108.69 or 0.39 lb.

The difference in greasy-fleece weights does not affect the unshorn body weights, for the sheep without coats were still the heavier.

Summary of results of fleeces in Experiment No. 4

- Greasy-fleece weight of all grades showed 0.72 pound in favor of coatless fleeces.
- Clean-fleece weight of all grades showed 0.51 pound in favor of coated fleeces.
- Shrinkage of hand samples from all grades of fleeces showed 6.8 percent in favor of the coated fleeces.
- Dirt content of hand samples from all grades of fleeces was 13.6 percent lower in the coated fleeces.

**Lamb crop:** No figures are available, but the cooperator, Mr. Klink of the Flag Ranch, states that the sheep with coats had about the same lamb crop as those without coats, and he could see no difference in the lambs up to shearing time. With only a small number of coated sheep in a group, the other sheep were afraid of the coated "apparitions", but when large numbers had their overcoats on, the others showed little fear. This factor should have a theoretical effect upon the lamb crop, except that the rams did not seem to be afraid of the coats, contrary to expectations.

**Loss of coats over 11-month period:** 46 percent of the coats were lost by being caught on snags and barbed-wire fences.

**Staple-length growth of fleeces:** The coated fleeces showed around a third more growth per month than the coatless fleeces.

**Economy of coats for wool production:** In the 11-month period the increase in clean wool would pay for a coat if all of the coats had a useful life of two years. This could not be done if the coats were kept on for an 11-month period. It might be done if the coats were put on in the fall and removed during the following shearing season.
Condition of coats after a year of use: Of the 240 coats which stayed on for the full 11 months, 125 or 52 percent were in good shape and fit to use again, while the other 115 or 48 percent were in poor shape and unfit for further use. These coats were not worn out but were torn from catching on snags and barbed wire. Some coats which had not been caught on snags, buck brush, or barbed wire have now been used for a total time of 18 months and are still in good, serviceable condition.

Cost of coats: The coats used in this test cost a dollar each.

Experiment No. 5 consisted of a group of mature ewes and a group of ewe lambs carried through to yearling age. The test was carried on with the Seaverson Livestock Company at Rawlins and ran from October 23, 1942, to April 30, 1943. There were 20 mature ewes wearing coats and a like number unprotected. Results obtained follow:

<table>
<thead>
<tr>
<th>Group 1</th>
<th>20 Mature Ewes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monthly wool growth during 6-month period</td>
<td></td>
</tr>
<tr>
<td>19 of 20 coated ewes</td>
<td>3.97 mm.</td>
</tr>
<tr>
<td>19 of 20 coatless ewes</td>
<td>2.24 mm.</td>
</tr>
<tr>
<td>Monthly gain in body weight during 6-month period</td>
<td></td>
</tr>
<tr>
<td>19 of 20 coated ewes (117.4—122.2)</td>
<td>0.80 lb.</td>
</tr>
<tr>
<td>19 of 20 coatless ewes (117.6—125.7)</td>
<td>1.35 lb.</td>
</tr>
<tr>
<td>Shrinkage of hand samples from fleeces</td>
<td></td>
</tr>
<tr>
<td>19 of 20 coated ewes</td>
<td>40.7 percent</td>
</tr>
<tr>
<td>19 of 20 coatless ewes</td>
<td>37.1 percent</td>
</tr>
<tr>
<td>Greasy-fleece weights</td>
<td></td>
</tr>
<tr>
<td>19 of 20 coated ewes</td>
<td>9.86 lb.</td>
</tr>
<tr>
<td>19 of 20 coatless ewes</td>
<td>10.59 lb.</td>
</tr>
<tr>
<td>Clean-fleece weights</td>
<td></td>
</tr>
<tr>
<td>19 of 20 coated ewes</td>
<td>4.01 lb.</td>
</tr>
<tr>
<td>19 of 20 coatless ewes</td>
<td>3.93 lb.</td>
</tr>
</tbody>
</table>

The coated ewes showed almost 77 percent more wool growth per month than the coatless ones. The coatless sheep showed greater monthly gain in body weight even when allowing for the differences in fleece weights. During the 7-month period there was a total difference in body weight of around 3 pounds per head (122.2 for the coated and 125.7 for the coatless). Although the coated fleeces showed a lighter shrinkage by around 3 percent, there was only an advantage of a tenth of a pound of clean-fleece weight in favor of the coated fleeces. The coats used in this 7-month test were in such shape that half of them would need to be replaced.
Group 2 — 20 Yearling Ewes

Monthly wool growth during 6-month period
20 of the 20 coated ewes (all ewes located in April) 2.91 mm.
19 of 20 coatless ewes (one ewe lost before April) 2.02 mm.

Monthly loss in body weight during 6-month period
20 of 20 coated ewes (74.4 to 72.3) 0.30 lb.
19 of 20 coatless ewes (75.7 to 75.3) 0.08 lb.

Shrinkage of hand samples from fleeces
20 of 20 coated ewes 53.5 percent
19 of 20 coatless ewes 58.6 percent

Greasy-fleece weights
20 of 20 coated ewes 6.06 lb.
19 of 20 coatless ewes 6.45 lb.

Clean-fleece weights
20 of 20 coated ewes 2.82 lb.
19 of 20 coatless ewes 2.67 lb.

The coated ewes showed more wool growth per month. The coatless sheep showed less loss per month in body weight even when allowing for the greater greasy-fleece weight. The coated fleeces showed a shrinkage of around 5 percent less, but the advantage in clean-fleece weight for these coated fleeces amounted to only 0.14 pound, which confirmed the results obtained with the mature ewes in Group 1.

Test No. 6 consisted of a continuation of the test with the yearling ewes of Test No. 5, studying their fleeces and body weights as two-year-olds as compared to their yearling fleeces and body weights to see the cumulative effect of wearing coats.

October 23, 1942, to April 30, 1943—First Year
November 11, 1943, to May 5, 1944—Second Year

<table>
<thead>
<tr>
<th></th>
<th>Coated ewes</th>
<th>Coatless ewes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1st year</td>
<td>2nd year</td>
</tr>
<tr>
<td>Number of ewes in test</td>
<td>20</td>
<td>19</td>
</tr>
<tr>
<td>Monthly wool growth in mm.</td>
<td>2.91</td>
<td>3.87</td>
</tr>
<tr>
<td>Monthly loss in unshorn body weight (lb.)</td>
<td>0.30</td>
<td>0.54</td>
</tr>
<tr>
<td>Shrinkage of hand samples (%)</td>
<td>53.5</td>
<td>63.4</td>
</tr>
<tr>
<td>Dirt-content hand samples (%)</td>
<td>9.9</td>
<td>23.8</td>
</tr>
<tr>
<td>Greasy-fleece weights (lb.)</td>
<td>6.06</td>
<td>10.13</td>
</tr>
<tr>
<td>Clean-fleece weights (lb.)</td>
<td>2.82</td>
<td>3.71</td>
</tr>
</tbody>
</table>

In the second year of the test, the coated sheep showed more monthly wool growth, confirming the first year’s results. However, the coated sheep in the second year showed a higher shrinkage than the coatless sheep, possibly in part because of the higher sweat and grease content of the coated
fleeces, for the dirt content, as expected, was higher in the coatless sheep. Because of a lower shrinkage, the coatless fleeces have a higher clean-fleece weight than the coated fleeces.

An index of the cumulative effect is shown by the fact that the coated ewes showed a gain in clean-fleece weight from the first to the second year of 0.90 pound as compared to a figure of 1.44 pounds for the coatless fleeces. The same relation is shown in monthly wool growth, with the coated ewes showing a difference between years of 0.96 mm., while the coatless ewes show a difference of 1.35 mm. In monthly loss of body weight the differences between years amounted to 0.25 pound for the coated ewes and 0.44 pound for the coatless ewes. The cumulative effect of the coats indicates that they did not promote as much clean wool per fleece; nor did they promote as much wool growth per month from the yearling to the 2-year-old fleeces as did the coatless sheep. However, the coated sheep did not lose as much body weight per month during the test from the age of a yearling to a 2-year-old as did the coatless sheep.

The indications are that in the first year the coats, under the conditions prevailing during the winter of 1943-44, had a retarding effect on the clean-fleece weight, because of a larger shrinkage and lighter greasy-fleece weight; also, the coats were responsible for larger losses of body weight during the 7-month period from November to May.

Of the 19 coats which were taken off at shearing time in May 1944, 15 were in excellent condition. The remaining four were in good, usable condition with only small tears in them. There was a deep covering of snow over the winter ranges from December on through to February; hence the coats were not subjected to wear from the brush as in former years.

CONCLUSIONS FOR ALL SIX TESTS

One of the aims of these tests was to find or design a sheep coat that would be suitable for sheep under range conditions. It had to stay on without continual readjustment and had to be durable and inexpensive. The original patterns of sheep coat were obtained from Australia but were too expensive, and duplicate patterns made in this country also were too expensive. The following pattern of a sheep coat was worked out and has proved satisfactory since it is simple in design, economical to make, and stays on the sheep satisfactorily. This pattern will fit the majority of range sheep from yearling to aged ewes, but the dimensions will have to be increased if the sheep to be fitted weigh over 125 pounds. Two measurements with a tape measure can be taken quickly as guides to size of coat.
When the sheep measures more than 31 inches from mid-neck to dock, the size of the coat shown in the illustration will have to be increased proportionately.

No. 10 duck or canvas, used in the coats, has proved satisfactory in most cases but is subject to wear, snagging, and splitting over the back when kept on the sheep for a full 12 months. Twelve-ounce burlap did not prove satisfactory in any way. Waterproof No. 10 duck was satisfactory, but was too stiff to drape satisfactorily on the sheep and was also too expensive. New plastic materials developed for rain coats in World War II have been tested by the manufacturer and give very good abrasion tests. They are flexible and have good draping characteristics, but cost more and for this reason have not been tried out.

Four-ply cotton rope, 5-16 inch in diameter, is required in the following lengths for each coat: 2 leg ropes about 40 inches long and one neck rope about 46 inches long. Prewar quotations on the design of coat illustrated ran from 45c to 80c per coat, according to the type of material, style of coat, and market conditions.
GREATY AND CLEAN FLEECE WEIGHTS, AND STAPLE LENGTHS OF RUGGED AND UN-RUGGED SHEEP

2ND EXPERIMENT 3RD EXP. TEST 1 3RD EXP. TEST 2 4TH EXPERIMENT 5TH EXP. MATURE 5TH EXP. YEARLINGS 6TH EXPERIMENT

FLEECE WEIGHT IN POUNDS

LENGTH OF STAPLE IN MILLIMETERS
The advantages and disadvantages of coats for Wyoming range sheep may be summarized as follows, based on experimental results and range observations:

**Advantages:**
1. Particularly useful on older sheep grazing on cold, windy, sandy ranges.
2. Improve the appearance of the wool, particularly the color and the blockiness of the tip.
3. Decrease the number of burrs in the wool.
4. Decrease the weathering of the wool.
5. Decrease the dirt content and shrinkage of the wool on dry, sandy ranges.
6. Increase the length of staple of the fleeces.
7. Decrease the death loss in older ewes.
8. Decrease the amount of wool pulled out by brush catching the fleece.
9. Protect the sheep from storms after early shearing and during the winter.

**Disadvantages:**
1. The coat must be properly tailored, designed, and adjusted to stay on the sheep.
2. The coats tear on wire fences and snags.
3. The coats need adjustment as least every six months.
4. Coats of No. 10 duck need replacement at least every 2 years.
5. The initial cost of coats, additional help, and vigilant herders necessitate additional expenditure.
6. Coats under the conditions of the tests are not practical for 7 months from October to April.
7. It is difficult to obtain a corresponding increase in price for the increased yield and length of wool.
8. Even heavy burlap is not sufficiently durable for sheep coats.

Chart 1 shows fleece weights and staple lengths for the rugged (coated) and unrugged (coatless) sheep from the second to the sixth experiment. The middle two columns, for each experiment show the greasy-fleece weight as the full height of the column, with the clean-fleece weight at the bottom portion of the column. The leftmost of the two columns is for the rugged (coated) fleeces, while the right-hand one is for the unrugged (coatless) fleeces. The two columns on the extreme left and right for each experiment show the staple length of the unrugged (coatless) on the right and the
AVERAGE GAINS AND LOSSES IN BODY WEIGHTS DURING COURSE OF EXPERIMENT
rugged (coated) fleeces on the left. These columns show the relationships between fleece weights and staple length in the rugged and unrugged sheep.

The second experiment ran from November to June, a total of 7 months.

The third experiment consisted of two tests, the first for 7 months and the second for only a little over 4 months.

The fourth experiment ran for a full 12 months, while the fifth and sixth experiments ran for 6 months during the winter.

In all of the experiments the unrugged sheep showed heavier greasy-fleece weights than the rugged sheep.

The clean-fleece weights were heavier in the rugged fleeces than in the unrugged ones in the second and fourth experiments, while they were similar or a little higher in the third, fifth, and sixth experiments. These results indicate very little differences in clean-fleece weights, which may be attributed to the wearing of rugs or coats. In two experiments the difference was quite marked but in the other cases there was little difference.

In all of the experiments the sheep with coats or rugs showed a longer length of staple than sheep without the protection of rugs, indicating that the protection afforded by the rugs stimulates the growth of wool fibers. In the fifth experiment with mature ewes and in the sixth experiment, the fact that longer staple length was associated with a lower weight of clean wool indicates that there might possibly be a reduction of follicular activity in the rugged sheep.

Chart 2 gives the changes in net body weight (unshorn body weight minus greasy-fleece weight) of the ewes in Experiments 3 to 5. The environmental conditions, including feed as well as protection by rugs or coats, have a marked effect on body weight. The chart shows that the unrugged sheep have an advantage in body weight over the rugged ones particularly at end of the experiment. Both rugged and unrugged sheep showed a gain in body weight during the experimental periods. The changes in body weight during the experimental period range from 0.02 to 0.07 percent—a very small change; and no appreciable change in body weight is shown by the rugged and unrugged sheep.

**FINAL CONCLUSIONS**

In all six tests there is indication that rugged sheep, when the rugs are on for a full year, give a larger amount of clean wool per fleece and much longer staple than the unrugged sheep, as shown in Experiment 4. However, it is not practical to keep the rugs on the sheep for a full 12 months.
because of excessive wear and loss of rugs. Experiment 2 showed that in older ewes the rugs or coats have an advantage in a cold, dry, windy winter, which existed during this experiment, as shown by the increased production of clean wool and a slightly longer staple.

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